

# EXERCISES

For more practice, see *Extra Practice*.

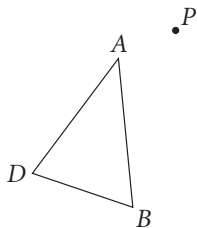
## Practice and Problem Solving

### **A** Practice by Example

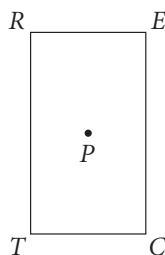
**Example 1**  
(page 648)

Copy each figure and point  $P$ . Draw the image of each figure for the given rotation about  $P$ . Label the vertices of the image.

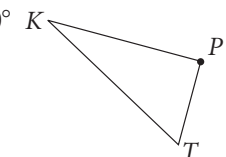
1.  $60^\circ$



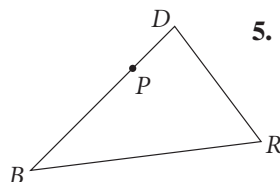
2.  $90^\circ$



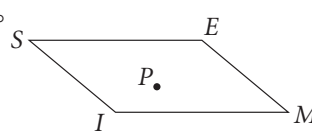
3.  $90^\circ$



4.  $180^\circ$



5.  $140^\circ$



Copy each figure. Then draw the image of  $\overline{JK}$  for a  $180^\circ$  rotation about  $P$ .

6.

7.

8.

9.

**Example 2**  
(page 648)

The large triangle, quadrilateral, and hexagon are regular. Find the image of each point or segment for the given rotation.  
(Hint: Green segments form  $30^\circ$  angles.)

10.  $120^\circ$  rotation of  $B$  about  $O$

11.  $270^\circ$  rotation of  $L$  about  $O$

12.  $60^\circ$  rotation of  $E$  about  $O$

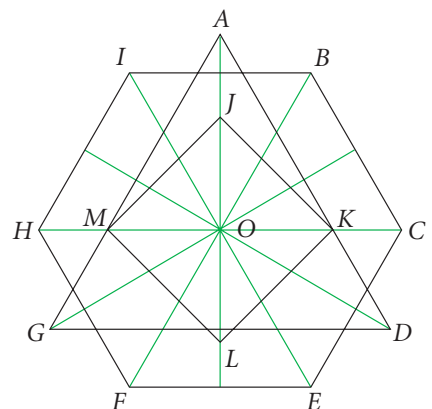
13.  $300^\circ$  rotation of  $\overline{IB}$  about  $O$

14.  $240^\circ$  rotation of  $G$  about  $O$

15.  $180^\circ$  rotation of  $\overline{JK}$  about  $O$

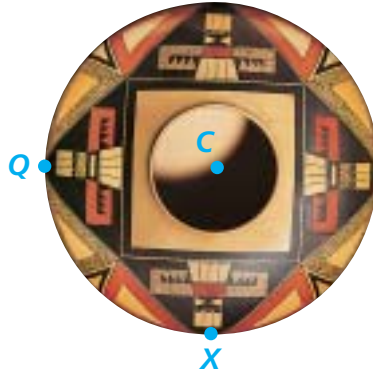
16.  $120^\circ$  rotation of  $F$  about  $H$

17.  $270^\circ$  rotation of  $M$  about  $L$

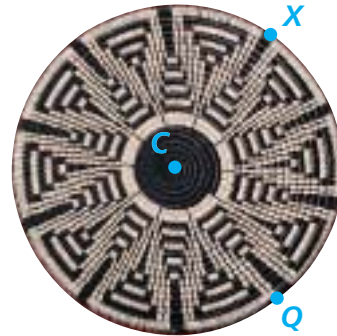


**Native American Art** Find the angle of rotation about  $C$  that (a) maps  $Q$  to  $X$  and (b) maps  $X$  to  $Q$ .

18.



19.



**Example 4**  
(page 649)

For each of Exercises 20–25, copy  $\triangle XYZ$ . Draw the image of  $\triangle XYZ$  for the given composition of rotations about the given point.

20.  $45^\circ$ , then  $45^\circ$ ;  $X$

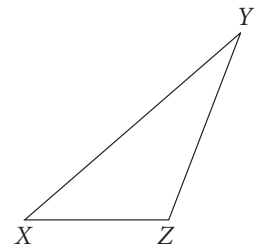
21.  $45^\circ$ , then  $45^\circ$ ;  $Y$

22.  $30^\circ$ , then  $30^\circ$ ;  $Z$

23.  $20^\circ$ , then  $160^\circ$ ;  $Z$

24.  $135^\circ$ , then  $135^\circ$ ;  $Y$

25.  $180^\circ$ , then  $180^\circ$ ;  $X$

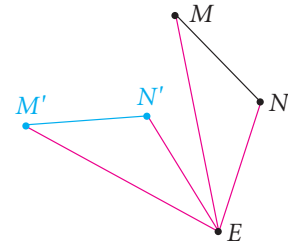


**B Apply Your Skills**

26.  $\overline{M'N'}$  is the rotation image of  $\overline{MN}$  about point  $E$ . Name all pairs of congruent angles and all pairs of congruent segments in the diagram.

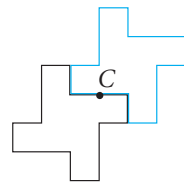


27. **Language Arts** The symbol  $\textcircled{a}$  is called a *schwa*. It is used in dictionaries to represent neutral vowel sounds such as *a* in *ago*, *i* in *sanity*, and *u* in *focus*. What transformation maps a  $\textcircled{a}$  to a lowercase *e*?

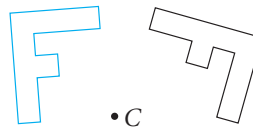


Find the angle of rotation about  $C$  that maps the black figure onto the blue figure.

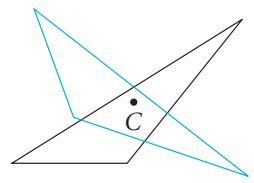
28.



29.



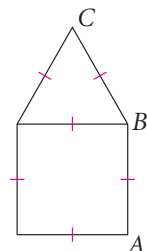
30.



31. Sketch the figure at the right. Then draw three images of the figure for rotations of  $90^\circ$  about each of  $A$ ,  $B$ , and  $C$ .

32. **Reasoning** If you are given a figure and a rotation image of the figure, how can you find the center and angle of rotation?

33. **Writing** Describe compositions of rotations that have the same effect as a  $360^\circ$  rotation about a point  $X$ .



34. a. **Coordinate Geometry** Graph  $A(5, 2)$ . Then graph  $B$ , the image of  $A$  for a  $90^\circ$  rotation about the origin  $O$ . (*Hint*: Consider the slope of  $\overline{OA}$ .)

b. Graph  $C$ , the image of  $A$  for a  $180^\circ$  rotation about  $O$ .

c. Graph  $D$ , the image of  $A$  for a  $270^\circ$  rotation about  $O$ .

d. What type of quadrilateral is  $ABCD$ ? Explain.



**Reading Math**

For help with reading and solving Exercise 32, see p. 653.



**Challenge**

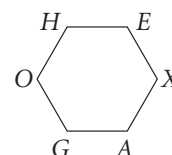


## Standardized Test Prep

### Multiple Choice

35. Name the image of  $X$  for a  $240^\circ$  counterclockwise rotation about the center of the regular hexagon.

- A.  $A$       B.  $G$       C.  $O$       D.  $H$



36. What is the image of  $(1, -6)$  for a  $90^\circ$  counterclockwise rotation about the origin?

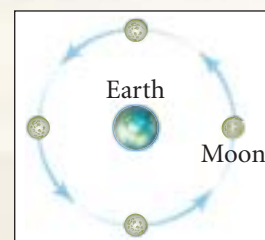
- F.  $(6, 1)$       G.  $(-1, 6)$       H.  $(-6, -1)$       I.  $(-1, -6)$

### Reading Comprehension

Read the passage below. Then answer the questions on the basis of what is *stated* or *implied* in the passage.



The same hemisphere of the moon always faces Earth. Thus, the motion of the moon about Earth for a given time interval can be modeled by a rotation. The center of the rotation is the center of Earth. The angle of rotation is determined by the time interval, given that one journey of the moon around Earth takes about  $27\frac{1}{3}$  days.



### Take It to the NET

Online lesson quiz at  
[www.PHSchool.com](http://www.PHSchool.com)

Web Code: afa-1203

37. What rotation is modeled by the motion of the moon?

- A. a circle rotating about its center      B. a circle rotating about a point  
C. 2 circles rotating around each other      D. a circle rotating around a circle

38. In how many days does the moon complete a  $90^\circ$  angle of rotation?

- F. about 4      G. about 7      H. about 14      I. about 27

### Short Response

39.  $\triangle XYZ$  has vertices  $X(1, 2)$ ,  $Y(0, 5)$ , and  $Z(-8, 0)$ .

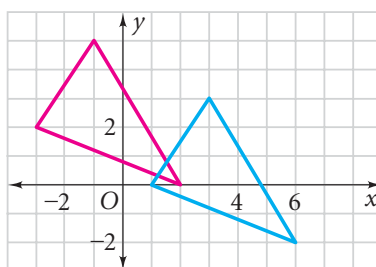
- a. Graph  $\triangle XYZ$  and its image after a  $270^\circ$  rotation about the origin.  
b. Name the coordinates of each vertex of the image.

## Mixed Review

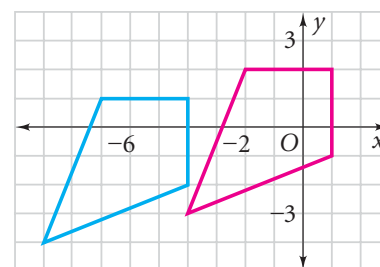
### Lesson 12-2

In each diagram, the blue figure is the translation image of the red figure. Write a rule to describe each translation.

40.



41.



### Lesson 10-7



42. **Geography** The United States has about  $3,540,000 \text{ mi}^2$  of land. Earth is approximately a sphere with radius 3960 miles. What percent, to the nearest tenth, of the surface area of Earth is the land area of the United States?

### Lesson 9-4



43. **Navigation** An airplane lands at a point 100 km east and 420 km south from where it took off. Describe the magnitude and the direction of its flight vector.